

## RESOLUTION

WHEREAS Governor’s Executive Order S-13-08 directed state agencies to consider a range of sea level rise scenarios for 2050 and 2100 to assess project vulnerability, reduce expected risks, and increase resiliency to sea level rise; and

WHEREAS the 2009 California Climate Adaptation Strategy called for all state agencies that are responsible for managing and regulating public health, infrastructure, or habitat that is subject to significant climate change to prepare agency-specific adaptation plans, guidance, or criteria; and

WHEREAS climate change in California during the next century is expected to shift precipitation patterns, accelerate sea level rise, and increase temperatures, thereby posing a serious threat to: California’s economy; the health and welfare of its population; and its natural resources; and

WHEREAS Assembly Bill 32 requires the State of California to reduce its greenhouse gas emissions to 1990 levels by 2020 and Executive Order S-3-05 requires the State to reduce greenhouse gas emissions 80 percent below 1990 levels by 2050.

NOW, THEREFORE, BE IT RESOLVED that it is the policy of the Sacramento-San Joaquin Delta Conservancy (Conservancy) to follow established state law and regulations regarding planning for climate change and reducing greenhouse gas emissions by developing a set of guidelines to assist the Conservancy in developing, establishing, and supporting projects that mitigate for climate change by reducing greenhouse gas emissions or have the capacity, or can increase the system’s capacity, to adapt to the effects of climate change.

## CLIMATE CHANGE GUIDELINES FOR THE CONSERVANCY

The Conservancy is a primary state agency to implement ecosystem restoration in the Delta in collaboration and cooperation with local governments and a wide range of interested parties. The Conservancy Board of Directors developed the following climate change guidelines to assist it in determining what could increase the Delta's resiliency to the effects of climate change within the context of the co-equal responsibilities of advancing environmental protection and the economic well being of Delta residents. Actions related to adapting to the effects of climate will be evaluated with the goal of promoting agriculture as a key industry in the Delta.

The Conservancy believes the regional economic and environmental health are linked to the Delta's vulnerability to potential climate change impacts, such as increased intensity of flooding or severity of drought, and that strengthening the Delta region's economy will help the Delta adapt to potential future conditions resulting from climate change.

The Conservancy is committed to establishing and maintaining partnerships with federal, state, and local governments, private business- and land-owners, and non-governmental organizations to develop and implement mitigation and adaptation strategies that address the needs and ability of the Conservancy to meet its mandates over time.

The Conservancy encourages projects that are resilient to climate change impacts. Such projects may be full-scale, pilot, or demonstration projects. Preferences will be given to projects containing effective or innovative adaptation measures and strategies that would minimize the effects of climate change. All projects should be consistent with state law and the Conservancy's enabling legislation and strategic plan.

The Conservancy understands that there are dissenting views on climate change and future climatic conditions are unknown. In the face of this uncertainty, the Conservancy will recognize the consensus of the scientific community and use the best available science in identifying climate change risks, adaptation strategies, and mitigation opportunities. The Conservancy understands that data continue to be collected and that knowledge about climate change is evolving; therefore, the Conservancy's Climate Change Guidelines will be updated periodically to integrate relevant new information and data.

### ***Carbon Management***

The Conservancy sees carbon management as an integrated approach to reducing greenhouse gas emissions and climate change impacts in the Delta, using a variety of strategies, such as those listed below, but not limited to:

1. Climate Change Research. When appropriate and consistent with the Conservancy's enabling legislation, the Conservancy may support research projects targeted to increasing understanding

of climate change impacts to the Delta (e.g. agricultural, economic, environmental), quantify carbon sequestration benefits of habitat enhancement and restoration projects, promote agricultural practices that reduce greenhouse gas emissions, and support projects that demonstrate the effectiveness of adaptive management strategies.

2. Education, Outreach and Guidance. The Conservancy will collaborate with others to provide up-to-date information and guidance on the latest climate change information pertinent to the Delta and best management practices for reducing greenhouse gas emissions. The Conservancy may collaborate with others to look for economic development opportunities in the Delta that result in reduced greenhouse gas emissions.
3. Reduction/Avoidance. Conservancy staff will work with applicants to identify, evaluate, and incorporate reasonable measures to reduce or avoid the greenhouse gas emissions of Conservancy-funded projects. The Conservancy will encourage use of best management practices and innovative designs that reduce or avoid greenhouse gas emissions and, as possible, will support developing these practices and designs through funding and other actions.
4. Carbon Offset Credits. Recognizing a carbon market could provide economic benefit to Delta residents, the Conservancy will explore the development of an offset credits program for farm carbon sequestration, which meets the requirements of the California Air Resources Board cap-and-trade regulation.
5. Coordination. Climate change adaptation strategies will be coordinated with the California Air Resources Board's AB 32 Scoping Plan process, when appropriate, as well as with other local, state, and national efforts to reduce greenhouse gas emissions.
6. Staff Operations. Where feasible, staff will attempt to reduce their work-related greenhouse gas emissions from travel, through the use of public transportation, carpooling, bicycling, fuel-efficient vehicles, clustering meetings and events, and using phone- and web-based conferencing technologies.

### ***Assessing Risk from Climate Change***

Sea-Level Rise. To meet the requirements of Executive Order S-13-08, the Conservancy will consider the current range of sea-level rise (SLR) projections presented in the Interim Guidance Document (CO-CAT 2010) in assessing projects. When assessing potential impacts, the Conservancy will consider the project's timeline and the project's capacity to adapt to SLR. The Conservancy will avoid using SLR values for project planning that result in high risk of climate change impacts to public health and safety, public and private investments, the environment, agriculture, and the economy of the Delta. The Conservancy will use the Interim Guidance Document (CO-CAT 2010), which describes the amount of risk involved in a decision as dependent upon the consequences and the likelihood of realized impacts that may result from SLR. Realized impacts depend on the extent to which a project integrates an accurate projection of SLR.

Other Impacts from Climate Change. Potential climate change impacts in the Delta include, but are not limited to, increased air, soil and water temperature; loss of agricultural land; flooding; drought; severe storms; increased salinity; degraded water quality; declining crop yields; decreased biodiversity; new

disease or pest invasion; invasive species; and loss of life. Not all Conservancy projects will be subject to climate change impacts; however, for those projects that have the potential to be impacted by climate change, the Conservancy will weigh the risk of climate change impacts to the project with the economic benefit of the project to the region. There may be cases where the known near-term benefits outweigh the unknown long-term risks to the project from climate change.

### ***Adaptation Strategies***

The Conservancy will encourage programs and funded projects that are consistent with our co-equal responsibilities to advance environmental protection and the economic well-being of Delta residents and contain strategies, such as the ones listed in the project examples below, that can assist the Delta in adapting to climate change:

- a. Innovative projects pertaining to any of the Conservancy's mandates that incorporate features that are resilient to climate change impacts or increase the area's ability to adapt to potential impacts from climate change;
- b. Delta island subsidence reversal and land accretion (e.g., rice cultivation) projects to reduce the risk of levee failure;
- c. Projects that reduce flood impacts through levee maintenance and improvement and other measures to protect farmland and reduce damages to Conservancy investments and meet the Conservancy's legislative mandates;
- d. Projects that protect or restore habitats (e.g., floodplain, riparian) that can lessen flood flows to reduce flooding in the Delta;
- e. Projects that create buffer zones adjacent to tidal wetlands to allow tidal wetlands to move toward land in response to SLR;
- f. Projects that conserve, restore and enhance habitats and land that sequester carbon;
- g. Projects that incorporate and contribute to overall ecosystem health and viability through preserving or reestablishing movement corridors for terrestrial and aquatic species;
- h. Projects which incorporate efforts to prevent the introduction or spread of invasive species or control invasive species populations.

### ***Adaptive Management***

Given the uncertainties associated with climate change related impacts on natural resources, restoration that can accommodate or adapt to climate change impacts is more likely to have longer-term success. A science-based adaptive management plan and long-term monitoring will be key components to successfully carrying out restoration and economic development that can adapt to the affects of climate change. The Delta Reform Act requires that ecosystem restoration actions in the Delta include a formal adaptive management strategy (Water Code section 85308(f)). The Fifth Staff Draft Delta Plan describes a nine-step adaptive management framework (Delta Stewardship Council 2011). The three broad phases and their respective steps are described below:

- Plan (define/redefine the problem; establish goals and objectives; model linkages between objectives and proposed actions; select and evaluate research, pilot, or full-scale action);
- Do (design and implement action; design and implement monitoring plan); and
- Evaluate and Respond (analyze, synthesize, and evaluate; communicate current understanding; adapt).

Restoration projects and other applicable projects funded by the Conservancy shall contain an adaptive management plan consistent with the adaptive management framework described in the Delta Plan.

DRAFT

## **SUPPORTING INFORMATION FOR RESOLUTION AND GUIDELINES**

Over the last half of the 20<sup>th</sup> century, changes in the climate patterns of the western United States were observed that are attributed to greenhouse gas emissions from human activities (Barnett et al. 2008; IPCC 2007). These observed patterns are mirrored in California’s changing hydrology and include increasing winter and spring air temperatures and extended growing seasons (Cayan et al. 2001), a greater proportion of precipitation falling as rain rather than snow (Knowles et al. 2006), less snowpack on mountain ranges (Mote 2003), and earlier snow-fed streamflows by 1 to 4 weeks (Stewart et al. 2005). The earlier runoff may also be accompanied by increases in the magnitude of peak runoff events and greater variability from year-to-year (Maurer 2007). These climatic variations are expected to continue into the 21st century even if greenhouse gases are substantially reduced, and will be experienced as larger and more sustained long-term trends (IPCC 2007).

### ***The Greenhouse Effect and Climate Change***

The Earth’s temperature is regulated by a process commonly known as the “greenhouse effect.” In this process, heat emitted by the Earth’s surface is absorbed by greenhouse gases (GHG) in the atmosphere. As the atmosphere warms, it in turn radiates a portion of this heat back to the surface. The most abundant GHG in the atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

Climate change is a shift in the typical weather pattern in a given region. Measurements of weather characteristics, such as temperature, precipitation, wind patterns, and storms can be used to assess changes in climate. The Earth’s climate has always been, and still is, constantly changing. However, the climate change observed today differs from previous climate change in both its rate and its magnitude (California Environmental Protection Agency 2006).

The United Nations Intergovernmental Panel on Climate Change (IPCC) in the Fourth Assessment Report (2007) concluded that average temperatures in the Northern Hemisphere during the second half of the 20<sup>th</sup> century were likely higher than any other 50-year period in the last 1,300 years. The IPCC reported the atmospheric concentrations of carbon dioxide, methane, and nitrous oxide were higher than previously measured using the ice core record of the past 650,000 years. The IPCC also reported that the average rate of increase in atmospheric carbon dioxide from 1960 to 1999 was at least five times larger than over any other 40-year period during the two millennia before the industrial era (IPCC 2007). These results confirm for the IPCC that climate change is occurring and is the result of human activity.

There are both human and natural causes of climate change. The Earth’s climate is influenced by changes in (1) atmospheric concentrations of GHG and aerosols, (2) solar radiation, and (3) land surface. The scientific standard to measure these changes and to understand how human and natural factors can contribute to warming or cooling is called “radiative forcing” (IPCC 2007). The IPCC Fourth Assessment Report analyzed radiative forcing from human and natural sources and concluded that: (1) most of the observed warming over the past 50 years is very likely due to human contributions to greenhouse gas concentrations; (2) carbon dioxide is the most important anthropogenic greenhouse gas; and (3) the

primary sources of increased carbon dioxide concentrations are from fossil fuel use and land use change, while those of methane and nitrous oxide are primarily due to agriculture. The IPCC further concluded that human activities have influenced ocean warming, continental-average temperatures, temperature extremes, and wind patterns.

### ***Emission Scenarios***

While there is general agreement that the planet is warming, the degree and timing of this change is less certain. In order to predict future climate change, it is necessary to determine how much GHG could be emitted into the atmosphere in the future and the potential response of climatic, oceanic and terrestrial systems to increasing atmospheric concentration of these gases. To address this uncertainty, the IPCC Special Report on Emissions Scenarios (SRES) developed a range of scenarios for future GHG emissions based on different social, economic, demographic, environmental, and technological developments (IPCC 2000).

The A1 scenario is characterized by a global population that peaks in mid-century, rapid economic growth, and accelerated introduction of new and more efficient technologies. There are substantial reductions in regional differences in per capita income and increased cultural and social interactions. This scenario is further divided into three categories based on energy sources: fossil fuel intensive (A1F1) – the highest emission scenario, non-fossil fuel energy sources (A1T), and balance across all sources (A1B).

The A2 scenario, medium-high emission scenario, describes continuously increasing population growth, slow regional economic growth, slower technological growth than other scenarios. The underlying theme is preservation of local identities and self-reliance.

The B1 scenario, the lowest emission scenario, describes the same population growth rate as A1, but with rapid changes in economic bases that are less material intensive, and the introduction of clean and resource-efficient technologies. There is an emphasis on environmental sustainability and global solutions.

The B2 scenario depicts a future with continuously increasing global population, but at a rate lower than A2. There is an intermediate level of economic development and technological change is less rapid and more diverse than in the B1 and A1 scenarios. Local solutions to economic, social, and environmental sustainability are the emphasis of this scenario.

Projected warming for different scenario emissions are provided in the IPCC Fourth Assessment Report and are shown in Table 1. These include best estimates of projected warming and the likely range due to uncertainties associated with the emission scenarios. Global average temperatures are projected to increase from 3.2 to 7.2°F (1.8 – 4.0°C) by the end of the 21<sup>st</sup> century. In the near-term, a warming of about 0.36°F (0.2°C) per decade is projected for the next 20 years over a range of SRES emission scenarios.

Table 1. Projected Temperature Change

Scenario	Temperature Change (Degrees at 2090-2099 relative to 1980-1999)			
	Best Estimate		Likely Range	
	°F	°C	°F	°C
Constant Year 2000 Concentrations	1.1	0.6	0.5 – 1.6	0.3 – 0.9
B1	3.2	1.8	2.0 – 5.2	1.1 – 2.9
B2	4.3	2.4	2.5 – 6.8	1.4 – 3.8
A2	6.1	3.4	3.6 – 9.7	2.0 – 5.4
A1F1	7.2	4.0	4.3 – 11.5	2.4 – 6.4

Adapted from IPCC 2007.

### **Sea Level Rise**

There are two major processes contributing to SLR. First, thermal expansion, where a warming atmosphere is causing the ocean to warm and water expands as it warms. Second, warmer temperatures are melting glaciers and continental ice sheets. Over the past century, sea levels have risen about 8 in (20 cm) along the California coast, similar to global mean sea level increases (Cayan et al. 2008a). The rate of global sea level rise has risen significantly in recent years and it is expected to continue to increase through the 21<sup>st</sup> century (IPCC 2007).

Future SLR due to thermal expansion and some components of melting ice can be projected. However, future contributions to SLR from the melting Greenland and Antarctic ice sheets could be significant, but current models are unable to satisfactorily quantify the rate of discharge from these ice sheets. Excluding these potentially significant contributions, global sea level is projected to rise 10 to 23 in (26 to 59 cm) by the end of this century under the highest emissions scenario (A1F1) and 7 to 15 in (18 to 38 cm) under the lower emissions scenario (B1) (IPCC 2007). If recent observations in ice discharge rates were to scale up in proportion to future global temperature change, the upper bound of sea level rise projections could increase by 4 to 8 in (10 to 20 cm) (IPCC 2007).

Another approach to projecting future SLR was developed using the calculated relationship between global mean temperature and sea level. This method was refined and applied to observed data of sea level and temperature for the years 1800 – 2000; the calculated values were found to very closely match the observed values (Vermeer and Rahmstorf 2009). Using the IPCC temperature projections over a range of climate scenarios from the Fourth Assessment Report, Vermeer and Rahmstorf (2009) estimate sea level to rise 32 to 70 in (81 to 179 cm) above 1990 levels by 2100. These projections do not include rapid changes in ice flow. It is not known if the ice-melt contributions to SLR contained in the last 120 years of observed data is sufficient to model future contributions. Another notable aspect of these projections is the time lag between emission reductions and a response in SLR, which suggests that emission reductions earlier in this century will be much more effective in slowing SLR than reductions later on.



## ***Sea Level Rise and Extreme Events***

The Delta is subject to high river discharge and storm surge (water that is pushed inland by the force of the winds from a storm and results in higher water levels). These two factors can severely impact the levees that protect the Delta, as the frequency of large storms is directly related to the frequency of levee failures (Florsheim and Dettinger 2007). Increasing SLR exacerbates the impacts of high tides, storm surge, and freshwater floods (Cayan et. al. 2008a). Rising sea levels combined with tides, storms, or climatic fluctuations (such as El Niño-Southern Oscillation events) result in high sea level extremes and the frequency of these extremes may increase if storms become more frequent or severe as a result of climate change. Extreme sea levels can result in salinity intrusion into the Delta. The greatest impact to the Delta will occur when extreme sea levels and freshwater floods coincide. The increase in the time levees are stressed by high water levels will raise the likelihood of failure significantly (Cayan et al. 2008b). During the 1997-98 El Niño event, non-tide water levels in parts of the Delta stayed above 16 in (40 cm) for longer than 12 hours (Bromirski and Flick 2008). As the magnitude of future SLR increases, the frequency and magnitude of extreme events will escalate, as seen in the 20-fold increase in extreme tides since 1915 as measured at San Francisco (Cayan et. al. 2008a). Because processes in the Bay-Delta and global climate systems are complex and interconnected, climate changes effects are uncertain; surprising and compounded responses may occur (Dettinger and Culbertson 2008).

SLR is expected to increase pressure on levees over time which could lead to a greater risk of levee breaches or overtopping (Knowles 2010). Failure to plan for SLR with continued investments in Delta levee maintenance and improvements will have negative implications for managed wetlands behind levees, such as those in the Suisun Marsh. A portion of the marsh is already subtidal. However, the majority of the Suisun Marsh would be in a subtidal zone under a 39 in (100 cm) sea level rise (Knowles 2010). While wetlands have the ability to build up organic and mineral sediment (accretion), current inorganic sediment supply may not be sufficient to prevent the shallowest areas of Suisun Bay from getting deeper, even under a moderate rate of SLR (Ganju and Schoellhamer 2010). Absent significant accretion, the seasonal gravity draining of leveed wetlands, managed as waterfowl habitat, would become impossible (Knowles 2010).

Salinity in the Delta is expected to significantly increase due to SLR and island flooding (Lund et al. 2008). With SLR the ocean pushes its higher-salinity water farther into the Delta. A one foot SLR may mean low enough salinity in Delta water to continue irrigation during the growing season; however, higher levels of salinity in the southern Delta, especially in the fall, would significantly increase the costs of drinking water treatment. A three feet SLR may make this water unsuitable for irrigation.

## ***Climate Change Impacts in the Delta***

In addition to SLR and extreme climatic events there are other potential impacts to the Delta from climate change. To better understand how future climate patterns may change, results from global climate models are “downscaled” to a finer resolution. This process helps correct some biases in areas

1 like California that have complex landscapes that cannot be adequately represented at the coarse scale  
2 of global climate models (Cayan et al. 2008b).

3  
4 Cayan et al. (2008b) evaluated different climate change model simulations from the IPCC Fourth  
5 Assessment to estimate future climate changes in California. In each simulation temperatures in  
6 California warm significantly by 2100, with increases from approximately +2.7°F (1.5°C) under the lower  
7 emissions B1 scenario to about +11°F (6°C) in the higher emissions A1F1 scenario. Human-induced  
8 climate changes are expected to progress rapidly (Dettinger and Culbertson 2008). This is illustrated by  
9 the projected changes in the likelihood of exceeding various annual-temperature increases in each  
10 decade of the 21st century, based on an ensemble of 84 projections from 12 climate models (Dettinger  
11 2005). By the year 2030, almost no years will be cool compared to the 20th century. Projected  
12 consequences of these temperature increases include further declines of snow pack, reduced viability of  
13 many species of fruit trees, increased range of agricultural pests, decreasing hydropower generation,  
14 increased fire frequency, and greater concentrations of air pollutants (Cayan et al. 2008c).

15  
16 In the Delta, similar changes may be expected. Cloern et al. (2011) simulated the B1 emission scenario  
17 using a model with low sensitivity to GHG emissions and the A2 emission scenario (medium-high  
18 emissions) with a medium-sensitivity model. In both scenarios, air temperatures in the Delta increase  
19 steadily, but the rate of change is more rapid in the A2 scenario than in the B1 scenario. Under these  
20 models, precipitation continuously declines through the end of the century in the A2 scenario. While  
21 there is no obvious trend in precipitation change in the B2 scenario, this projection shows large variation  
22 from year-to-year (interannual variability), which includes years of extreme high precipitation and multi-  
23 year drought. As with precipitation, unimpaired runoff and snowmelt declines in the A2 scenario. Runoff  
24 displays the same large interannual variability as precipitation in the B2 scenario. As with state-wide  
25 patterns, there is a shift toward runoff occurring earlier in the year.

26  
27 These climate and hydrologic projections were used to assess how habitat quality will be altered by  
28 climate change. Water temperatures in the Delta will increase steadily in both scenarios, with more  
29 rapid increases in the A2 scenario. Lethal temperatures for both Chinook salmon and Delta smelt will  
30 occur more frequently and the timing of spring spawning temperatures will shift to earlier in the year  
31 (Cloern et al. 2011, Wagner et al. 2011). Managing for these increased temperatures will be more  
32 challenging as decreasing snowmelt reduces the amount of cold water runoff available in upstream  
33 reservoirs. In addition to temperature changes, aquatic species will be affected by the change in water  
34 quantity. In the A2 scenario, the frequency of spring floods with the duration needed for successful  
35 spawning and rearing of Sacramento splittail decreases (Cloern et al. 2011).

36  
37 Another indicator of habitat quality, suspended sediment supply, is projected to decrease in both future  
38 climate scenarios, which will increase the vulnerability of tidal marshes and mudflats to SLR (Cloern et al.  
39 2011). Decreased sediment supply also has implications for native species, such as the Delta smelt, that  
40 are adapted to turbid waters. Conditions for nonnative species will also become more favorable as  
41 temperatures increase.

Agriculture will be affected by the consequences of climate change as well. Irrigation demand will increase to meet a higher evaporative demand, the occurrence of agricultural pests will increase, and rising temperatures will have a direct effect on commodity quality and quantity (Hayhoe et al. 2004). Dairy production in California is projected to decrease by as much as 22% by the end of the century under the high emission scenario. Wine grape quality is affected by extreme temperatures during the ripening period. Across the range of emission scenarios, wine grapes are projected to ripen one to two months earlier and at a higher temperature, leading to degraded quality (Hayhoe et al. 2004).

#### ***Carbon Emissions in the Delta***

Agricultural land use practices in the Delta have oxidized more than 2 million acre-feet of peat soils collectively over the past century. This has led to subsidence down to 20-25 feet below sea level on many islands in the Delta (Mount and Twiss 2005). These soils continue to oxidize from current agricultural land use practices, emitting about 4.4 to 5.3 million tons of carbon dioxide annually. This represents approximately 1% of California's total emissions, with California being the twelfth-largest emitter of carbon in the world (Merrill et al. 2010). The amount of peat available for oxidation has been and will continue to decrease over time. Peat soils have already been completely removed in the southern Delta and portions of the eastern Delta, but are still present in the central, western, and northern Delta and, if farmed, will continue to oxidize and emit carbon dioxide (Lund et al. 2007).

While the Delta is a source of carbon emissions, it has the potential to sequester carbon as well. Research conducted in the Delta over the past 15 years shows that native tule wetlands have the ability to capture carbon at very high rates and, in the process, accrete soil that reverses subsidence (Merrill et al. 2010). Executive Order S-3-05 calls for California to reduce GHG emission to 80% below 1990 levels by 2050. Projects that sequester carbon in the Delta, like carbon capture wetland farms, can contribute toward the State reaching this goal and have the additional benefit of reversing subsidence and reducing pressure on existing levees.

## **CALIFORNIA LEGISLATION AND POLICIES**

The State of California has adopted a wide variety of laws and policies targeted at reducing GHG emissions and addressing the potential impacts from SLR. Below is a summary of key climate change laws and policies pertinent to the Delta.

### Executive Order S-3-05

This order calls for the State to reduce GHG emissions to 1990 levels by 2020 and to reduce GHG emissions to 80 percent below 1990 levels by 2050. Additionally, this order established the Climate Action Team (CAT) for State agencies. The CAT is chaired by the Secretary of the California Environmental Protection Agency.

### Assembly Bill 32 (2006)

The California Global Warming Solutions Act of 2006 (AB 32) set the 2020 GHG emission reduction goal into law. It directed the Air Resource Board (ARB) to develop a scoping plan to identify how to best reach the 2020 limit. AB 32 also directed the ARB to adopt regulations requiring the mandatory reporting of GHG emissions and to identify and adopt regulations for discrete early actions to reduce GHG that could be enforceable on or before January 1, 2010.

On October 20, 2011, the ARB adopted the final cap-and-trade regulation. Rules for quantifying offset credits have been developed for livestock projects, ozone depleting substances projects, urban forest projects, and U.S. forest projects.

### AB 32 Climate Change Scoping Plan (2008)

This plan outlines actions to reach the GHG reduction goals required in AB 32. Several strategies pertinent to agriculture are encouraging investments in methane capture systems at dairies and increasing carbon sequestration.

### Senate Bill 97 (2007)

SB 97 required the Governor's Office of Planning and Research to develop recommended amendments to State CEQA Guidelines for addressing GHG emissions. These amendments were to provide guidance on how to determine significance and mitigate the effects of GHG emissions. The CEQA Guidelines were amended in March 2010 to incorporate these provisions.

### Executive Order S-13-08

Executive Order S-13-08 calls for the State to implement a number of actions to reduce vulnerability to climate change. This order directs the California Natural Resources Agency to request that the National Academy of Sciences convene an independent panel to develop a Sea Level Rise Assessment Report. Prior to the release of this report, all State agencies shall consider a range of SLR scenarios for the years 2050 and 2100 in order to assess project vulnerability and, to the extent feasible, reduce expected risk

1 and increase resiliency to sea level rise. Additionally, this order directs the California Natural Resources  
2 Agency, through the CAT, to develop a state Climate Adaptation Strategy.

### 3 2009 California Climate Adaptation Strategy

4 This document, required by EO S-13-08, summarizes the best known science on climate change impacts  
5 to California and outlines strategies to increase California's resiliency from the impacts from climate  
6 change. Adaptive and mitigation strategies are seen as complementary and equally necessary  
7 approaches. One key recommendation is for all State agencies responsible for managing and regulating  
8 public health, infrastructure or habitat subject to significant climate change should prepare agency-  
9 specific adaptation plans, guidance, or criteria by September 2010.

### 10 Amendments to the CEQA Guidelines (2010)

11 On March 18, 2010, the Natural Resource Agency adopted CEQA Guidelines Amendments, implementing  
12 SB 97. The Governor's Office of Planning and Research summarized the amendments as follows:

- 13 • "Lead agencies must analyze the greenhouse gas emissions of proposed projects, and must  
14 reach a conclusion regarding the significance of those emissions.
- 15 • When a project's greenhouse gas emissions may be significant, lead agencies must consider a  
16 range of potential mitigation measures to reduce those emissions.
- 17 • Lead agencies must analyze potentially significant impacts associated with placing projects in  
18 hazardous locations, including locations potentially affected by climate change.
- 19 • Lead agencies may significantly streamline the analysis of greenhouse gases on a project level by  
20 using a programmatic greenhouse gas emissions reduction plan meeting certain criteria.
- 21 • CEQA mandates analysis of a proposed project's potential energy use (including transportation-  
22 related energy), sources of energy supply, and ways to reduce energy demand, including  
23 through the use of efficient transportation alternatives."

### 24 State of California Sea-Level Rise Interim Guidance Document (2010)

25 This document was developed by the Sea-Level Rise Task Force of the Coastal and Ocean Working Group  
26 of the California Climate Action Team (CO-CAT). It provides guidance for incorporating SLR projections  
27 into planning and decision making for projects in California and will be regularly revised to incorporate  
28 the latest scientific understanding on climate change and SLR. The Interim Guidance Document  
29 recommends using the range of SLR values shown in Table 2. They note that these projections do not  
30 account for catastrophic ice melt and, therefore, may underestimate actual SLR. After 2050, the three  
31 different SLR values are based on low (B1), medium (A2), and high (A1F1) emission scenarios.

Table 2. Sea-Level Rise Projections using 2000 as the Baseline

Year		Average of Models	Range of Models
2030		7 in (18 cm)	5-8 in (13-21 cm)
2050		14 in (36 cm)	10-17 in (26-43 cm)
2070	Low	23 in (59 cm)	17-27 in (43-70 cm)
	Medium	24 in (62 cm)	18-29 in (46-74 cm)
	High	27 in (69 cm)	20-32 in (51-81 cm)
2100	Low	40 in (101 cm)	31-50 in (78-128 cm)
	Medium	47 in (121 cm)	37-60 in (95-152 cm)
	High	55 in (140 cm)	43-69 in (110-176 cm)

Source: State of California Sea-Level Rise Interim Guidance Document (2010)

Other recommendations include consider the project timeframe, adaptive capacity of the project, and risk tolerance when selecting SLR estimates; coordinate with other state agencies when selecting values of SLR and, where appropriate and feasible, use the same projections of SLR; future SLR projections should not be based on linear extrapolation of historic sea level observations; consider trends in relative local mean sea level; consider storms and other extreme events; and consider changing shorelines.

#### Resolution of the Ocean Protection Council on Sea-Level Rise (2011)

This resolution states that State agencies should incorporate consideration of the risk posed by SLR into all decisions regarding areas or programs potential affected by SLR. State agencies should follow the recommendations described in the Interim Guidance Document developed by the CO-CAT and any subsequent guidance documents. State agencies should assess potential impacts and vulnerabilities over a range of SLR projections, including analysis of the highest SLR values, and should avoid making decisions based on SLR values that would result in high risk.

## ACRONYMS

CAT	Climate Action Team
CO-CAT	Coastal and Ocean Working Group of the California Climate Action Team
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
SLR	Sea Level Rise
SRES	Special Report on Emissions Scenarios

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